because it has been already done is so great, and the consequent material loss to the nation so serious, that the time cannot be far distant when the Governments of this and other countries will have no choice, but yield to the demands made for a moderate annual grant towards defraying the expenses incurred in preparing and publishing these indispensable aids to all workers in science.

OUR BOOK SHELF

Berly's Electrical Directory. Third Edition. (London and New York, 1884.)

THIS work consists of three separate directories, separately paged, but bound up together; the first, of 228 pages, relates to British trades and professions connected with electricity; the second, of 273 pages, is devoted to similar matters from America; whilst the third is Continental. Of the last, 71 pages are French and Belgian, 12 German, and 3 relate to other countries, chiefly Russia. This arrangement, though convenient probably to the compilers, strikes us as being bad for many purposes. The American and French sections are particularly full of information. The British section opens with remarks on the progress made in electrical business during the past year, after which come various tables and formulæ. These are by no means satisfactory. In the formulæ for dimensions of units, many of the numbers which should have been printed as powers are given as simple multipliers. Though the table begins with C.G.S. units, and professes to describe those accepted by the British Association and the International Congress of 1881, the ohm is given as equal to 10^7 absolute units and the volt as 10^5, whereas the figures should respectively be 10^9 and 10^8. All this is very misleading. So also is the following statement:—"Calling gravitation the natural unit of force, the absolute unit of force will be $\frac{1}{9\cdot81}$th part of it." This statement ushers in the following definition:—"*Unit of Mechanical Effect* is the unit of force carried up through one centimetre, or $\frac{1}{9\cdot81}$ raised one centimetre." Is it possible that this chapter on formulæ has been translated literally from the pages of some French writer who was in the habit of using a mixed metre-gramme-second system instead of either the centimetre-gramme-second or the metre-kilogramme-second system? With the exception of the scientific part, the editing appears to have been carefully and soundly done, and the commercial information is very extensive.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

"The Unity of Nature"

IT was, I think, in the course of last year, or of the year preceding, that I ventured to remonstrate against the use sometimes made of your columns by Mr. G. J. Romanes for the purpose of inculcating his personal beliefs, and disbeliefs, on subjects which lie outside the boundaries of physical science.

The observations made by him in your paper of March 20 upon the book I have lately published ("Unity of Nature") show that in that remonstrance I committed an offence which Mr. Romanes has not forgotten or forgiven. Nevertheless I must repeat it; and this time I have the advantage of his own confession, that "the pages of a scientific journal are not suited to an examination" of those parts of my book which he has nevertheless denounced in your pages with unusual violence of language. If your pages are not suited to such an examination, neither can they be suited to comments which nothing but that examination could justify. The tone of these comments is a very clear proof of the necessity of our all keeping within the marches when we meet on neutral ground. Scientific facts and scientific hypotheses constitute that neutral ground. On the other hand, the bearing of these facts and of these hypotheses on questions of philosophy and of religion constitutes a separate region in which, if we meet at all, it must be outside the pages of a purely scientific journal. In that separate region it has always been my endeavour to argue without personal passion and without contumely towards opponents. I should be ashamed in any argument to display the animus which has in this case dictated the language of Mr. Romanes on subjects which, by his own confession, he has no right to drag into your pages. He may hold that the highest aim of the human intellect is to prove the mindlessness of nature. My book deals, and was intended to deal, with this philosophy; and I did not expect Mr. Romanes to like it. How much he dislikes it is remarkable. But he will find no passage in it which descends to the level of some of his comments.

Having dismissed, as irrelevant in your columns, the criticisms of Mr. Romanes on the "Unity of Nature" which have no connection with science, I now turn to some of those which have this connection, and are at least perfectly legitimate in their character.

Mr. Romanes is quite right when he says that I object to the "*newer philosophy*" which makes experience the source of instinct. In my view this theory is, in the strictest meaning of the word, nonsense, because experience is obviously a "synthesis of intuitions," and not the source of them. It is a plain fact that instinctive movements and instinctive sensations are the conditions precedent—the sole materials—of experience. Experience is nothing but the memory in living creatures of their own previous action on external things, and of the reaction of external things upon themselves. It is the combined consciousness of both which builds up what we call experience. But in every step of this process, whether of action, or of reaction, or of the combined memory of each, not one instinct only, but several instincts are concerned. Experience therefore is the result of instinct, and not the converse.

With this argument Mr. Romanes does not even attempt to deal.

He does, however, attempt to deal with my contention that instinct is always strictly correlated with organic structure, and that special instincts are always connected with "organs already fitted for and appropriate to the purpose." He says that my own case of the dipper ought to have taught me better; "for," he adds, "the dipper belongs to a non-aquatic family of birds, and *therefore* has no organs specially adapted to its aquatic instincts."

This argument, as an argument, is a *non sequitur*; and as a statement of fact is altogether erroneous. It is quite true that the dipper has not webbed feet. But it is not true that webbed feet are at all necessary for aquatic habits of a particular kind; nor is it true that the dipper is wanting in other peculiarities of structure which are most specially adapted to its peculiar aquatic habits and instincts. There are many birds which swim excellently well without webbed feet, as, for example, all the Gallinules, and some of the Tringidæ. The dipper does not need webbed feet, because it neither swims nor dives in deep water; and because on the other hand it positively needs feet free from web for grasping stones under rapid streams, as well as for grasping rock-surfaces in the places of its nidification. On the other hand, the structure of its wings, and above all the structure and texture of its feathers, are all specially modified and adapted to its aquatic habits.

It is for Mr. Romanes to prove, if he can, that the dipper once had an ancestor which began to dive in water, whilst as yet its wings had not a shape and a texture adapted to the purpose, and whilst its plumage was still pervious to water, and so was liable to be drenched and sodden.

Mr. Romanes protests against my suggestion that rudimentary organs may, sometimes at least, be the beginnings of a structure destined for future use, and not the relics of a structure whose use has been in the past. Yet in the same paper he himself suggests that the dipper may be on the way to having webbed feet, and only wants them now because it has "not yet had time to de-

velop" them. But when these webs do begin to appear, they would naturally be small, and would appear to be rudimentary; so that in this stage they would exactly represent the "wholly untenable doctrine" which Mr. Romanes denounces as an "inversion of Mr. Darwin's teaching." As a matter of fact rudimentary organs on the way to future use can be identified in the aquatic larvæ of the Ephemeræ.

The truth evidently is that the theory of the origin of species by transmutation, involves of neces ity a constant succession of structures which are on the wane, and another succession of structures which are on the stocks. Whether any particular structure now dissociated from use, belongs to the one or to the other class, is a question of evidence from associated facts. But the idea of some structures being on the rise, is an idea inseparable from the theory of evolution as taught by Darwin. Fully persuaded, as I am, that there is a very large amount of truth in that theory, I am equally persuaded that, as yet understood, it is incompetent to solve the most important phenomena of creation. In the hands of Mr. Romanes, and of many others, it is almost reduced to the repetition of mere verbal formulæ, under which anything and everything may be brought, only because they are empty of any definite meaning. The derivation of instinct from experience is an excellent example.

ARGYLL.

Rain-band Spectroscopy Attacked Again

I HAVE just had the honour of receiving a copy of an essay read before the Philosophical Society, Washington, D.C., and printed in the *American Journal of Science* for the present month, wherein I read on p. 209:—

"The results of observations with the rain-band spectroscope are now called in question by many prominent meteorologists. In fact the unsatisfactory nature of the evidence may be easily shown to the satisfaction of any one possessing an instrument. If the spectroscope is first turned to the sky in any direction and afterward to a white wall fifty feet distant, it will be found impossible to distinguish between the appearance of the rain-band as shown by the whole atmosphere and by the layer fifty feet thick."

If this be the most damaging accusation that can be brought up, after the memorable correspondence in both NATURE and the *Times* during the autumn of 1882, there is hope of converting "the prominent meteorologists" yet.

For cannot they, as well as other men, see, that a white wall close to an observer in daylight, necessarily reflects the light, and with that, the spectrum, of the sky which is illumining it, solar lines and telluric lines and all!

Or if the worthy gentlemen still doubt, let them illumine their white wall at midnight with policemen's lanterns or Swan's incandescent lamps; and then I can promise them they will get out of it and the "layer of air fifty feet thick" in front of it, neither solar nor telluric spectrum lines in any kind of weather.

C. PIAZZI SMYTH

15, Royal Terrace, Edinburgh, March 25

The Remarkable Sunsets

IN reply to inquiries sent out by me to Prof. John Milne of the University of Tokio, Japan, I am informed that no volcanic dust was known to have fallen in Japan during or after the Krakatoa eruption. He forwards, however, the following extracts, which may be of interest to your readers.

JOHN W. JUDD

Science Schools, South Kensington, S.W.

"*Japan Gazette, Friday, Sept.* 21, 1883.—Shortly after noon on August 30 the sun seemed to diminish in power, and a uniform yellow gray haze spread over the sky, gradually becoming more pronounced, and at two hours before sunset its rays were merged into a faint halo emerging from a globe of light no larger than the full moon. On Friday, August 31, at 8 a.m., sun the same. At 11 a.m. looked like full moon; could easily observe it with the naked eye. At intervals, faint clouds like puffs of smoke crossed the sun's face; they were enormously high. No wind; atmosphere dull and heavy, and neither heat nor light. September 1, the same. On Sunday, sun became as usual, and haze passed away. The Japanese were alarmed, and expected earthquakes."

Prof. Milne adds the note: "If this were due to Krakatoa, almost 2500 miles away, the speed of the dust must have been thirty miles an hour, assuming the date of the eruption to be 12 p.m. on August 26."

THE coloration of the sky in the neighbourhood of the sun, described by "B. W. S." in NATURE of March 27 (p. 503), has been repeatedly observed by myself from February 20 (or thereabouts) up to March 24. My first record of it is on February 24, when I describe it as a "rusty-red" tint. On other occasions I have called it "rusty brown" and "pale brick-red." Sometimes it has had a purplish or roseate hue. It has been chiefly seen between 10° and 20° from the sun (at a rough estimate), and only when the sun was hidden by a detached cloud. Frequently, when the sky has been clear, the intervention of a house or other object between the observer and the sun has revealed the presence of a hazy metallic-looking glare around the sun—an appearance not perhaps very remarkable in itself, but remarkable by its frequent repetition.

If, as seems probable, the explanation of these phenomena is to be found in a gradual subsidence of the reflecting matter which occasioned the remarkable sunsets, it will be well for observers to be prepared with suitable arrangements for catching what may fall. I have myself had in operation for some time past two separate devices for this purpose, the one intended for dry weather, the other for rain. In dry weather I expose a tray containing a number of glass slides, each with a drop of glycerine in a shallow cell, ready to be covered with this glass after sufficient exposure. For rain I use a 12-inch bell-glass supported in an inverted position on a three-legged stand, the legs partly buried in the earth, and the height such as to raise the receiving area of the glass to 30 inches above the soil. A rain-gauge is less suitable for the purpose, and experience has shown me the necessity of guarding against the introduction of particles of soil by the rebound of hailstones.

An investigation of this kind is difficult in the neighbourhood of a city, and it is much to be wished that observers living in isolated situations may be induced to undertake it.

It may be worth recording that on February 24, after an interval of several weeks, we had a striking recurrence of the sunset phenomena so often described. It was not perhaps the very finest example, but, as regards the primary glow, there had been nothing equal to it since January 12. Unfortunately I was not able to watch for the secondary glow. It is singular that at both the beginning and end of this series of phenomena there should have been outlying examples separated by some weeks from the rest. The first of the peculiar sunsets observed in this country appears to have been on November 9. Then I find no record until November 24. From that date (allowing for interruption by weather) they may perhaps be considered to have been continuous until February 2, becoming scarcely noticeable towards the last. Then, finally, after an entire absence of fully three weeks there comes, on February 24, a sunset which must be ranked amongst the finest of the series.

Clifton, March 31 GEORGE F. BURDER

REFERRING to the "decidedly unusual *pink tinge*" occasionally observed around the sun "when shining in a somewhat hazy sky, the colour being brought out with great distinctness if a light cloud happens to be passing across it" (see NATURE, March 27, p. 503), I would mention that, under the described circumstances, I have often noticed last winter a peculiar colour, to which I would apply the French term *velure d'oignon* (onion skin), used to describe certain kinds of champagne. I offer this suggestion, as I know the value of precise and happily chosen terms, especially in the difficult matter of the terminology of colours.

O. S.

Heidelberg, Germany, March 29

Thread-twisting

THE habit of thread-twisting with the palm of the hand on the thigh is one which may be seen in every part of India at the present day; we think it can hardly be termed a rude method, or a savage art, though the Mohammedans, whose ancestors came not so very long ago from Central Asia, practise it as much as, or even more than, the Hindoos. As "J. S." observes in NATURE of March 20 (p. 478), it may be one of the survivals from a barbarous period which we have lost since the introduction of machinery. Perhaps some of your correspondents may be able